the study of ten or twelve cases, and those were the relative frequency of a tuberculosis of the kidney and the relative frequency of the condition of which Dr. Moffitt spoke—the Grawitz tumor. It seems to me that tuberculosis of the kidney is much more frequent that usually supposed and that the symptoms are misleading on account of its being somewhat difficult to demonstrate the tubercle bacilli in the urine. I am quite impressed with the opinion that tuberculosis of the kidney is a relatively frequent condition and much more frequent that we generally deem it to be. Oftentimes rather slight symptoms will point to a tuberculosis of the kidney where the bleeding is relatively very limited. On the other hand sometimes we will have enormous hemorrhages from a kidney with practically no symptoms at all. Very recently a case passed into my hands which surprised me by the amount of blood that was lost, with absolutely no other symptoms. The urine, however, was loaded with tubercle bacilli. Why hypernephroma should be rather frequent in California I do not know, but there are few of us who have had experience with abdominal surgery who have not met one or two of these cases. Yet one would judge that the Grawitz was a comparatively rare condition. In San Francisco so many have come before my notice that it does seem as Dr. Moffitt has suggested that here it is a relatively frequent condition.

Dr. MacLaughlin, Pasadena: I have had some experience the last year which has led me to recognize the difficulty offered in interpreting the meaning of hematuria which should be regarded as a symptom. I think in every case of hematuria it is very important and we must regard it purely as a symptom and that the clearing up of the diagnosis sometimes requires a great deal of work. I am sorry to say that very little of this work has been done by the average general practitioner. Recently I had a case of a woman with hematuria who had been advised by four doctors to have the kidney removed. On cystoscopic examination the bladder was found to be normal and upon catheterization normal urine was found to be coming from the side supposed to have tuberculous kidney, and bloody urine and pus coming from the opposite side. This proved to be a stone on the side opposite to that where the tumor was supposed to be. I could report two more cases in which the operation was finally done on the side opposite to that supposed to have the trouble. Another point in these cases is the importance of rest. I had a man from a mining camp who had been injured with a large chunk of coal on the left side, with an immediately following hematuria. This persisted for three months in spite of all treatment. He passed large quantities of blood, in fact so much that he was anemic. There were no other symptoms and no pain. I did nothing for him except to order rest in bed, and in three weeks his hematuria had completely disappeared. Another class of cases are those of stone. Frequently we hear of a kidney lesion simulating a stone with hematuria. I do not hear so much about it now. That is simply because the great majority of these cases can be cleared up by frequent microscopic examination and X-ray pictures. Ninety-nine out of every one hundred cases where we get hemorrhages simulating stone in the kidney, it is actually stone. I had three cases recently in the hospital, all of whom had blood in the urine and all were supposed to have stone in the kidney, but all cleared up in a very short time. However, in every one I succeeded in finding a small calculus which was passed while the patient was under my observation. A great many of these cases are due to a sudden passing of a stone while the patient is under observation. Careful observation should be made of the urine in every case of hematuria.

PENTOSES.*

By MR. A. HALDEN JONES, Los Angeles.

Pentoses occur in nature in many fruits, e. g., cherries, plums, huckleberries; in vegetable gums, as gum arabic or gum acacia, in cherry gum, also beet gum from our sugar beet. Here they exist as pentasones which are polysaccharides, for the five carbon sugars as starch is for the six carbon sugars. Pentoses occur in marine plants; they have been found in several varieties of seaweed. The lignin test, which is used by botanists to demonstrate the site of wood-formation in the growing plant depends upon the presence of wood sugar which is a pentose. Pentoses also occur in the nucleic acids of many plants—in fact, the yeast plant furnishes a convenient source of nucleic acid.

In the animal body many nucleic acids containing pentose radicals lie in close relation to the process of life. You will remember that the nuclein of the physiological chemist is the same as the chromatin of the histologist. Such nucleic acids have been demonstrated in the pancreas, liver, spleen, thyroid and brain; also, in the head of the spermatozon.

From the standpoint of pathology, pentoses sometimes are of considerable importance. Some sarcomata possess a high pentose content. And again, we find cases of chronic pentosuria. This condition persists on a pentose free diet. Pentosuria is not of grave clinical significance, yet if it is mistaken for diabetes mellitus it may be the cause of much needless worry and trouble to the patient. And, moreover, the diabetic diet does not influence the amount of pentose excreted. The observation has been made repeatedly (Sahli) that such cases are injured by the strict dietary of the more grave disease. In such cases, as those just cited, chronic pentosuria and malignant tumors, the five carbon sugars must be a product of metabolism. Whether this is a product of perverted metabolic or enzymic activity, or whether it is an exaggeration of the process which provides normally the pentose for nucleic acid, is a matter of conjecture.

When fruits containing pentose are ingested a temporary pentosuria, and so-called alimentary pentosuria, readily is obtained. The amount of pentose excreted bears a direct relation, of course, to the amount ingested. Not all of it is excreted. When ingested pure, these sugars pass the easist of all into the urine. And in the case of xylose, may be demonstrated after the ingestion of only 0.05 grm. (Emerson.)

Several questions arise concerning the role of pentoses in plant and animal physiology. Some of these questions may be mentioned here: First, why does the plant store pentoses in the fruit? Is it for the growing embryo? Why does the plant use pentose in preparing lignin, its so-called skeleton—even in the maple tree, which certainly has plenty of other sugars available? In the case of the

* Read at the Thirty-Eighth Annual Meeting of the State Society, Coronado, April, 1908.

animal organism on a pentose free diet, what is the source of the nucleic acid pentose, etc. Also, can the animal organism use pentoses for glycogen formation the same as it does other carbon sugars? And, is the old rule true, which states that only sugars containing three atoms of carbon or some multiple of three can function in glycogen formation? This is the question we are considering today.

To test this point, pure arabinose was prepared from gum arabic. The experimental animals used were chickens, twenty-four hours old. The glycogen estimation was done according to the method of Dr. Pflugger. After inversion of the glycogen, the resulting dextrose was calculated quantitatively by the use of the cyanide process, as modified by Dr. Stookey.

In the first set of chickens, fifteen twenty-four-hour old chicks were used. Four were used as controls. These proved to be glycogen-free, this agreeing with the observations of Pflugger.

The others were fed the pure pentose in amounts varying from one to three grammes. Six were killed six hours after feeding; three were fed several times and killed twenty-four hours after the first feeding. Two died soon after being fed. In none was there any evidence of glycogen formation. One of the forty-eight-hour chickens gave a slight reduction of copper, but from this no conclusion could be drawn, all the others being negative.

These results were unsatisfactory in some respects. Of course, the hepatic cells of the chickens were not used to forming glycogen, and it was thought possible that a different result might follow if the pentoses were furnished to hepatic cells in the habit of forming glycogen. Some of the chickens had a diarrhea soon after feeding; the quantities worked with were very small, the heaviest liver weighing 1500 mg.

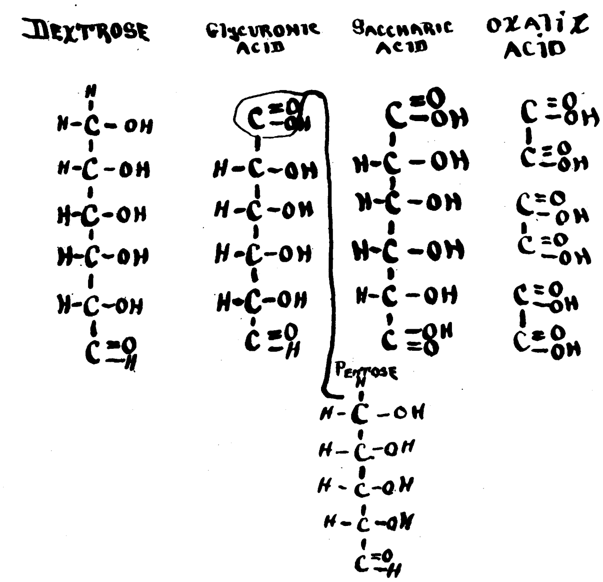
In another series half-grown chickens were used. These were rendered practically glycogen free by starving in a refrigerator. They were then fed pure pentose in quantities of six to eight grammes. The livers of these gave no more reduction of copper than the livers of controls killed before the injection of pentose.

Concerning the origin of pentose in the animal organism on a pentose-free diet, the following suggestion is offered as an explanation:

The chart gives what are undoubtedly some of the intermediary products in the oxidation of dextrose to carbon dioxide and water. You will notice that the first oxidation gives glycuronic acid. Now, if from glycuronic acid CO.2 be removed, pentose results, as you may see. Such a removal of CO.2 from the molecule is paralleled by the process which gives rise to the two ptomaines, cadaverin and putrescin, from lysin and ornithin. This occurs outside of the body in substances like fish ova and sperm, which contain large amounts of the hexon bases (lysin and ornithin). This explains the cases of ptomaine poisoning after eating fish which have been canned without the removal of the sperm ova. This takes place in the body in the rare condition known as diaminuria, cadaverin and putrescin occurring in the urine.

The results obtained in this series of experimental animals are not considered final. The study will be continued, using a larger number of animals and the conditions varied to meet the indications as now seen.

You may ask, "Is there any comparison between the amount of work involved on the part of the hepatic cells in converting a five-carbon sugar into glycogen and that involved in converting the substances which are known to be precursors of glycogen." Some of these precursors are the monosaccharides, dextrose, levulose and galactose; the disaccharides, maltose, lactose and saccharose; the polysaccharides, starch, dextrin, etc. The latter can function as glycogen formers only after being hydrolyzed to monosaccharides in the alimentary canal. Glycerin is a three-carbon compound. According to the work of Cremer this can function and a sugar and glycogen form. And only through glycerin can



fat influence, directly, glycogen formation. Concerning the ability of proteid to affect glycogen formation, opinions vary. Most investigators agree that those proteids giving the alpha naphthol test, i. e., those containing a carbohydrate radical may directly influence glycogen formation. Yet feeding glucosamin the carbohydrate radical has given slight or no results. And on the other hand, Dr. Stookey feeding pure casein obtained positive results. Many other cleavage products of proteid have been fed. The results have been positive and negative with no definite rule. Einden with alanin obtained positive results. In feeding some of the cleavage products a factor of error is confronted on account of the gastro-intestinal irritation and consequent interference with absorption. This was marked with arabinose.

In conclusion, we may say that the hepatic cells which are able to swing the six carbon levorotatory ketose, laevulose to the dextrorotatory glycogen which on cleavage yields only aldose, that these cells seem to be unable to use the five carbon chain to form reserve carbohydrate.